CTENOLEPISMA ROTHSCHILDI SILVESTRI (ZYGENTOMA: LEPISMATIDAE) IN AUSTRALIA

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Abstract

Ctenolepisma rothschildi Silvestri was collected in compost at Longreach, Qld. It has a reputation for dispersal by man but, while found at times in houses, is not necessarily synanthropic. The material collected is described in detail according to current criteria and key features for identification noted.

Introduction

In April 2011, small to medium-sized silverfish were found to be abundant in woodchip compost at the base of trees in a park garden at Longreach in Queensland. Collected specimens were later identified as *Ctenolepisma rothschildi* Silvestri, a species apparently not previously recorded from Australia but with a well established history of being distributed by man.

Ctenolepisma rothschildi was first described without illustrations from poor quality Ethiopian material by Silvestri in 1907. In 1922 he republished this description almost verbatim with six illustrations, inexplicably changing the description of urotergites with 3+3 bristlecombs from the correct II-V to II-VI, presumably a typographical error. Irish (1995) confirmed its synonymy with *Ct. diversisquamis* Silvestri, 1908, originally described from the Cape Verde Islands, as well as part of the *Ct. nigra* (Oudemans, 1890) type series (specimen from Bogor, Indonesia). Wygodzinsky (1972) had previously confirmed the synonymy of *Ct. reducta* Folsom, 1923 (described from Puerto Rico) with *Ct. diversisquamis*, as suggested by Paclt (1967). Paclt (1967) also listed *Ct. brachyura* Silvestri, 1918 from Kenya as a synonym of *Ct. diversisquamis*, without explanation, while Irish (1995) proposed that it is highly likely that *Ct. incita* Silvestri, 1918 from Kenya is also conspecific with *Ct. rothschildi*.

Irish (1995) commented that the species is often anthropophilic while Wygodzinsky (1972) noted that it is clearly dispersed by man but not necessarily synanthropic. Irish (1995) recorded the species in houses, in an old box and in a trunk of clothes, as well as being intercepted during quarantine inspections (mostly in North America) in didi divi pods (*Caesalpinia coriara*), dried herbs, banana leaf packing and peanuts. Mendes (2011) recorded the species on books, in houses and in hotels in Brazil.

The species is recorded by the above authors from Aruba, Brazil, the Cape Verde Islands, Colombia, Cuba, the Dominican Republic, Ethiopia, French Polynesia, Gambia, Germany, Honduras, India, Indonesia, the Marquesas, Montserrat, Nigeria, Papua New Guinea, Puerto Rico, Sierra Leone, Somalia, Sri Lanka, the United States of America, Venezuela and Zaire. I have been unable to find any published reference to its presence in Australia, although

its presence at a relatively remote inland town suggests it has been in Australia for some time.

Compared with the other species of *Ctenolepisma* introduced into Australia (the well known *Ct. longicaudata* Escherich, 1905 and the less common *Ct. lineata* (Fabricius, 1775)), this species is only about half their size and is easily distinguished by the presence of two types of scales. In fact, no other species of silverfish in Australia is known to have the pauciradiate scales of *Ct. rothschildi*. These scales may, however, be lost in poorly preserved material and were not mentioned in the original descriptions of the species nor for its synonym *Ct. reducta*. They were, however, described on *Ct. diversisquamis* as well as both *Ct. incita* and *Ct. brachyura*. Poor material lacking scales can, however, be identified on the basis of the urotergal chaetotaxy.

Watson and Li (1967) presented a key to the peridomestic species of silverfish in Australia. *Ct. rothschildi* will key to '*Ctenolepisma* 4' but no further, as the 'two pairs' of dorsal combs only extend to abdominal tergite V. Some caution needs to be exercised when using the number of dorsal combs as most abdominal tergites also have lateral combs visible from above. Tergites II-V, II-VI or II-VII actually have 3+3 combs on each tergite although only 2+2 of them are clearly dorsal. Recent authors tend to refer to the total number of tergal combs per segment.

A more complete description of the Longreach material follows. The arrangement of the urotergal bristlecombs, the pauciradiate scales and the shape of urotergite X and its combs allows easy identification of the species in an Australian context.

Materials and methods

Locality data were recorded using a Garmin *e*trex™ hand-held GPS unit. Measurements of a subset of 9 specimens in 75% ethanol were taken using a 10/100 scale in the 10x ocular of an Olympus CHT stage microscope. Specimens were placed in a Petri dish one third filled with black sand so that the part to be measured could be oriented close to horizontal. Specimens were dissected using an Olympus SZ61 stereo microscope and mounted on slides using Tendiero solution.

Drawings of specimens in alcohol and on slides were made with the aid of an Olympus CX31 binocular microscope fitted with a U-DA drawing attachment.

Abbreviations: Roman numerals are used to number the abdominal segments from anterior to posterior; asl - metres above sea level; AM - Australian Museum, Sydney, Australia; GPS - Global Positioning System; H+B - head and body length; HW - head width; L/W - length to width ratio; PI, PII, PIII - pro, meso and metathoracic legs respectively.

Systematics

Family Lepismatidae (Latreille)

Ctenolepisma rothschildi Silvestri, 1907

(Figs 1-41)

Ctenolepisma rothschildi Silvestri, 1907: 514.

Lepisma nigra Oudemans, 1890 (*pro parte*): 82.

Ctenolepisma diversisquamis Silvestri, 1908: 153.

Ctenolepisma brachyura Silvestri, 1918: 19.

Ctenolepisma reducta Folsom, 1923: 170.

? *Ctenolepisma incita* Silvestri, 1918: 17.

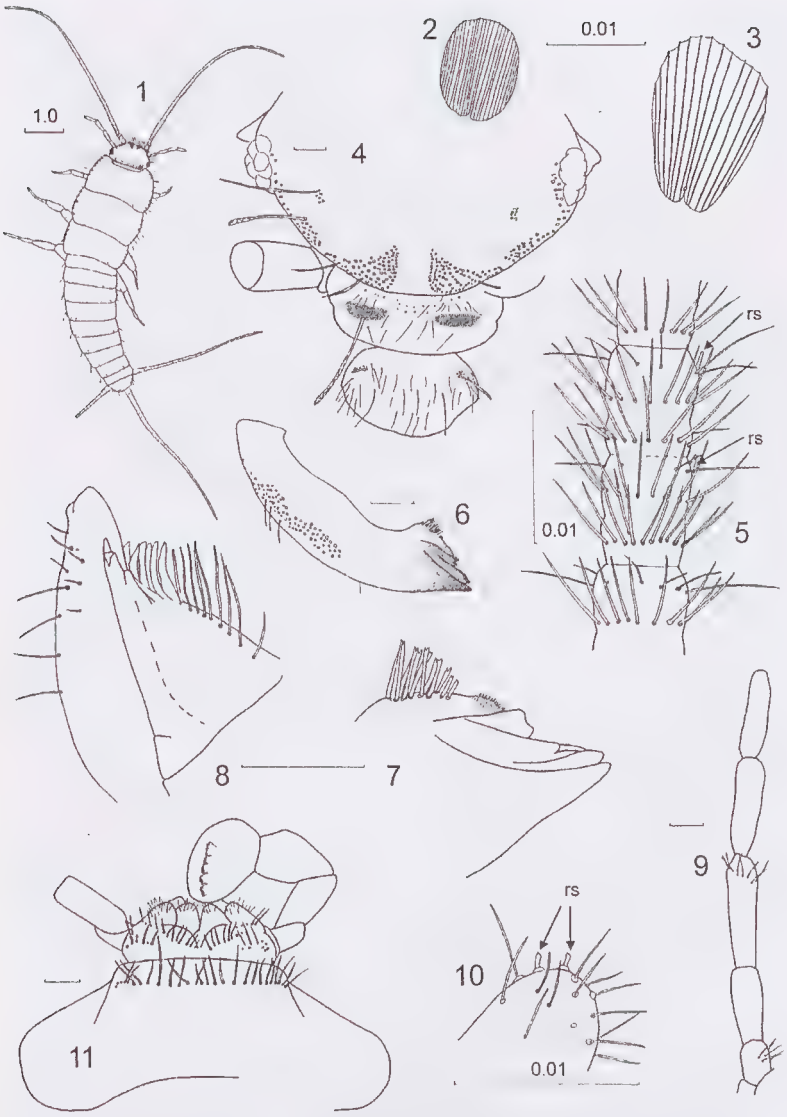
Material examined. AUSTRALIA: 4 ♀♀, 8 ♂♂, 2 juv., Queensland, Longreach (town park), S23°26.474' E144°15.218', 193 m asl, 9.iv.2011, Graeme Smith: 3 ♀♀, 7 ♂♂, 2 juv. in alcohol (AM accession numbers K304953-960), 1 ♀ (K260964-65) and 1 ♂ (K260966-67), each on 2 microscope slides.

Description. Body length of largest specimens collected 8.4 mm (♀), 6.3 mm (♂): maximum head width 1.11 mm (♀), 0.95 mm (♂); thorax: length 0.31-0.38 H+B; thorax L/W 1.41-1.73; maximum preserved length of antenna up to 0.77 H+B; maximum preserved length of cerci 0.57 H+B, median dorsal appendage 0.59 H+B. Body (Fig. 1) with thorax not much (10%) wider than anterior five abdominal segments. Live specimens appear very dark above and light grey/straw colour below. Dorsal scales dark, some are smaller and have 20-30 fine black rays, others larger with only about 13 very strong rays (Figs 2-3); ventral scales mostly of fine rayed type with rays much lighter in colour, scales on femur modified to narrower, shorter forms. Hypodermal pigment chestnut, flagella of antennae fairly evenly but lightly pigmented, pedicel with more pigment especially externally, scape also with more pigment especially below, head with strong pigment around eyes, clypeus and frons without pigment, maxillary palp with moderate pigmentation on all articles except ultimate article, labium without pigment and labial palp with pigment on penultimate and 3rd article but only a very small patch mediad near base of ultimate article; pronotum with some pigment among bristles on antero-lateral corners, legs without much pigment, coxae with very light pigment on anterior external "shoulder" and among bristles on external margin, trochanter without pigment, femur with light pigment on the external margin becoming more obvious distally, tibia and basal tarsal article with moderate pigment, distal tarsal articles without pigment, stylets with moderate pigmentation except at each end, cerci and appendix dorsalis with indistinct bands of light pigment which become increasingly longer distally; in some specimens the terminal appendages do not appear banded. Macrochaetae hyaline, light straw-colour, feathered, especially on head with more posterior macrochaetae, e.g. on terminal filaments, mostly smooth.

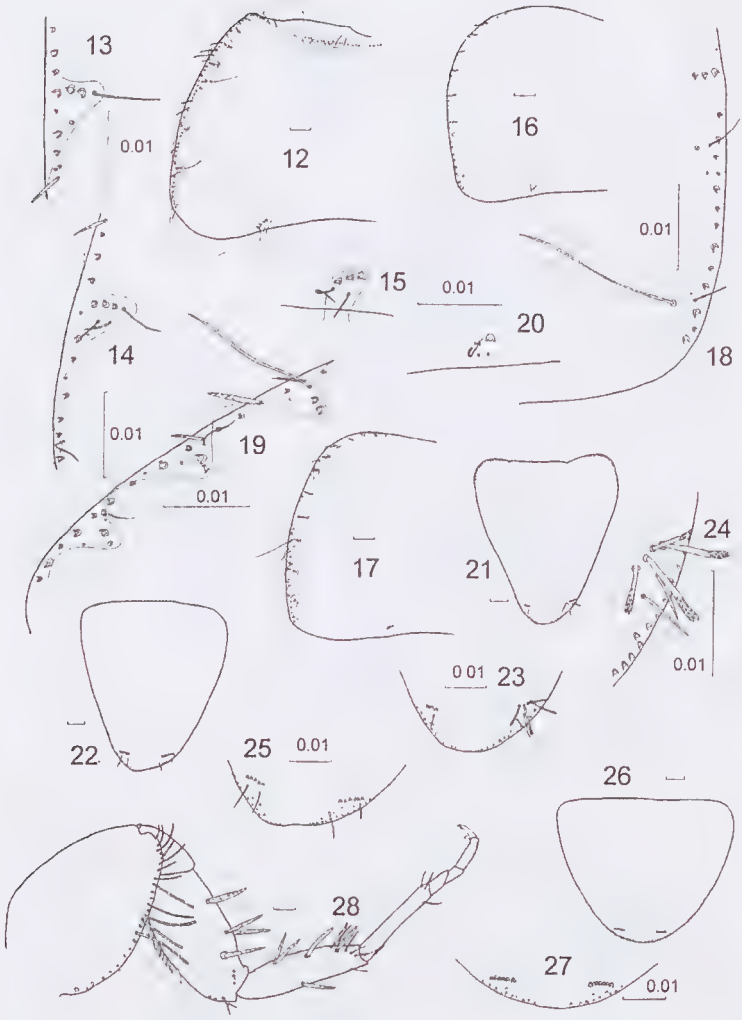
Head wider than long (Fig. 4), anterior margin with subtriangular anterior bushes on each side formed from several subparallel curved rows of macrochaetae, as well as marginal row(s) laterally extending back to and above the eyes and 1+1 small isolated groups of several macrochaetae on each side remote from the marginal series each with a long thin smooth seta; clypeus with large 1+1 densely bunched bushes of long, strong feathered macrochaetae as well as smaller setae; labrum with smaller 1+1 densely bunched bushes of smaller feathered macrochaetae as well as other finer setae, some as long as the macrochaetae of the bushes. Eyes dark with 12 ommatidia. Antennae long, probably up to about three-quarters H+B; the more apical articles with two rod-like sensillae (one near the apex and one near the mid-point) of every second article (Fig. 5). Mandibles (Figs 6-7) typical with distinct molar and incisor areas; a group of about 15 setae with bifurcate tips distally adjacent to the molar area and a long bush of 70+ setae/macrochaetae externally. Maxilla (Fig. 8) with lacinia with 3 strong teeth, six lamellate processes and a row of 9 long setae, galea longer than lacinia; maxillary palp (Figs 9-10) with apical article 3.3-4.9 times longer than wide and about the same length as the penultimate article (0.92-1.08), apex of ultimate article with 2? small rod-like sensillae, similar in appearance to those on the antennae. Labium (Fig. 11) short and broad with rows of setae on both the pre- and postmentum; labial palp short, apical article wider than long (L/W 0.74-0.96) with mediad widening, 5 papillae in a single row.

Pronotum (Fig. 12), in well-scaled specimens, with setal collar neatly framed by subrectangular gap in the scale cover, collar composed mostly of a single row of short macrochaetae with two submedial regions where 2-4 macrochaetae are arranged in weak, oblique, subparallel rows; lateral margins with 7+7 combs of 2-4 macrochaetae including the two open trichobothrial areas; anterior trichobothrial area (Fig. 13) about one-third the way along the lateral margin, consists of a trichobothrium located at the mediad end of a comb of 2 macrochaetae; the posterior trichobothrial area (Fig. 14) is located about three-quarters of the way along the lateral margin, with the trichobothrium at the mediad end of a comb of 3 macrochaetae, 1+1 posterior sublateral combs (Fig. 15) with 3 macrochaetae, all combs and trichobothrial areas located in distinct gaps in the scale cover. Mesonotum (Fig. 16) with 8-9 and metanotum (Fig. 17) with 6 lateral combs of 2-4 setae, both trichobothrial areas located more posteriorly (Figs 18-19) as well as posterior combs (Fig. 20).

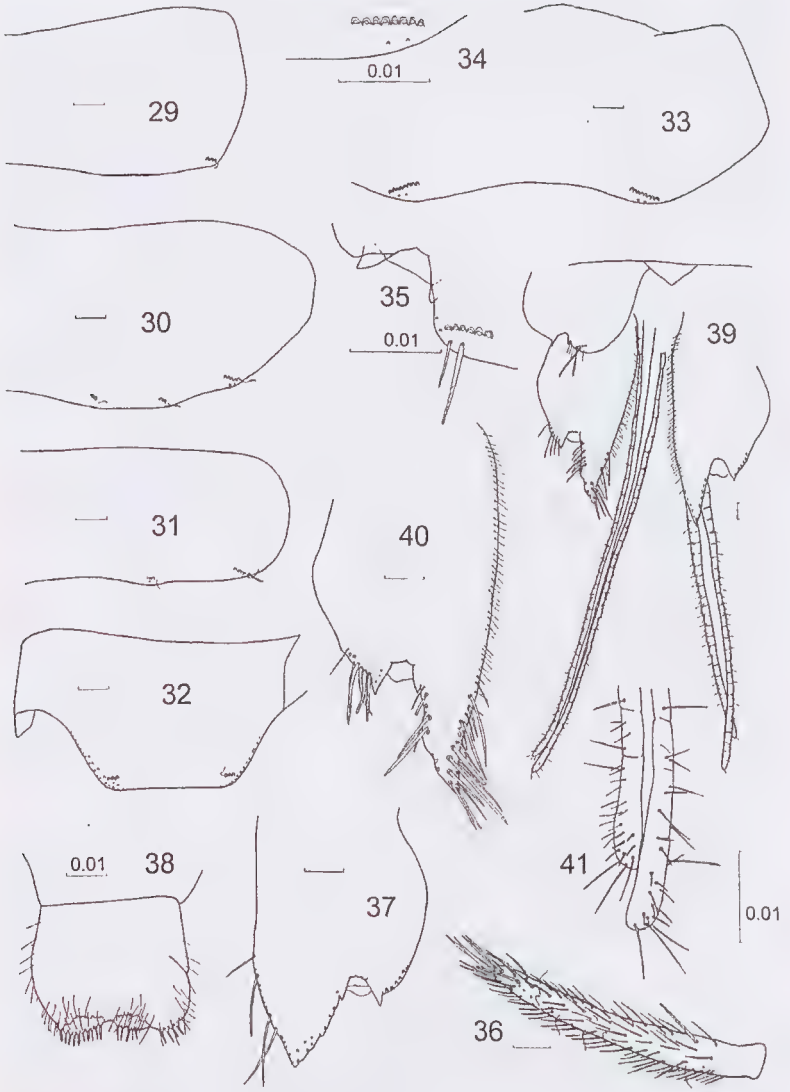
Pro- and mesosterna (Figs 21-22) of approximately equal size and shape (rounded subtriangular) with 1+1 short posterior submarginal combs of 3-4 and 5-6 feathered macrochaetae respectively (Figs 23-25) as well as some marginal setae; metasternum (Fig. 26) broader and shorter with 1+1 posterior submarginal combs of 6-7 feathered macrochaetae, the distance between the combs about 3 times the length of the combs (Fig. 27).



Figs 1-11. *Ctenolepisma rothschildi* Silvestri. (1) Habitus, dorsal view; (2) Multiradiate scale; (3) Pauciradiate scale; (4) Head, anterior dorsal view, showing some of the feathered macrochaetae; (5) Article of midsection of antennae showing rod-like sensory papillae (**rs**); (6) Mandible; (7) Same, enlargement of apex; (8) Maxillae, galea and lacinia; (9) Maxillary palp; (10) Same, enlargement of apex with rod-like sensory papillae indicated; (11) Labium. Scale bars: 0.1 mm unless otherwise indicated.



Figs 12-28. *Ctenolepisma rothschildi* Silvestri. (12) Pronotum, left half, with edges of scale cover indicated by fine line; (13) Same, anterior trichobothrial area; (14) Same, posterior trichobothrial area; (15) Same, posterior comb; (16) Mesonotum, left half; (17) Metanotum, left half; (18) Mesonotum, posterior section of right lateral margin with trichobothrial areas; (19) Metanotum, posterior section of left lateral margin with trichobothrial areas; (20) Mesonotum, right posterior comb; (21) Prosternum; (22) Mesosternum; (23) Apex of prosternum; (24) Same, enlargement of left comb, showing feathered macrochaetae (25) Apex of mesosternum; (26) Metasternum; (27) Same, enlargement of apex; (28) Metathoracic leg, showing only larger setae and macrochaetae. Scale bars: 0.1 mm unless otherwise indicated.



Figs 29-41. *Ctenolepisma rothschildi* Silvestri. (29) Urotergite I; (30) Urotergite V; (31) Urotergite VIII; (32) Urotergite X (♀); (33) Urosternite V; (34) Same, enlargement of lateral comb; (35) Urosternite VIII, stylet insertion and lateral comb; (36) Stylet of segment IX; (37) Coxite IX of ♂; (38) Penis; (39) Genital region of ♀, ventral view; (40) Coxite IX of ♀; (41) Ovipositor, apices of posterior gonapophyses. Scale bars: 0.1 mm unless otherwise indicated.

Legs not particularly elongate (Fig. 28), tibia L/W of legs PI 2.5-3.7, PII 2.5-3.3, PIII 3.2-3.9; tarsi L/W PI 5.1-6.1, PII 4.8-7.0, PIII 8.3-9.8. Surface of coxae with broad, rounded scales, as well as long feathered macrochaetae along outer margin. Femur with small, narrow, rounded scales along proximal two-thirds of outer margin, and four stout finely feathered macrochaetae below. Tibia with five (?) stout, finely feathered macrochaetae on posterior margin and one midway along the anterior margin. Tarsus with basal article longer than following three together, pretarsus with long slightly curved outer claws and smaller medial claw.

Urotergite I with infralateral combs only (Fig. 29), urotergites II-V with 3+3 combs (Fig. 30), urotergites VI-VIII with 2+2 combs (Fig. 31), urotergite IX short (about half the length of preceding urotergites) and glabrous. Urotergite X short, trapezoidal (Fig. 32) with 1+1 combs of 3 macrochaetae, as well as several marginal setae. Urosternites I and II glabrous, urosternite III-VIII with 1+1 lateral combs of 5-9 macrochaetae (Figs 33-35) as well as 1-3 smaller feathered setae between the comb and the margin. Details of the number of macrochaetae per comb are given in Table 1, which differs slightly in numbers from the 2-4 macrochaetae per urotergal bristlecomb given in Irish (1995).

Table 1. Number of macrochaetae per bristlecomb.

Segment	Urotergite			Urosternites
	Lateral	Sublateral	Submedial	
I	3	-	-	-
II	3	2-3	2	-
III	3	2-3	2	6
IV	4	3	2	7
V	5	2-3	2	8
VI	5-6	-	2	8-9
VII	5	-	2	7
VIII	5	-	2	5-6
IX	-	-	-	-

Both sexes with 2 pairs of well pigmented, long stylets, armed apically with several strong spines (Fig. 36), stylets of VIII 60% the length of those on IX.

Coxite IX in the ♂ (Fig. 37) with fringe of setae internally and several setae on distal end of external margin, internal process about 3.3 times longer than the external process and 1.1 times as long as broad at its base. Penis (Fig. 38) typical with numerous glandular setae apically, each set on a protuberance. Parameres absent.

Genital region of ♀ as in Figure 39, coxite IX also with fringe of setae along internal margin, internal process (Fig. 40) somewhat narrower than that of ♂,

about 1.8 times longer than wide at its base and 3.5 times longer than the external process. Ovipositor thin, very long (up to 2.3 HW), exceeding internal process by about 4.3 times the length of the process, composed of about 33 articles. Distal articles of posterior gonapophyses VIII as in Fig. 41.

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